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(54) SUPPORT MEMBER FOR CARRYING AQUEOUS MATERIAL

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| 34896Y/20<br>SEARLE G D & CO<br>22.03.73-G8-014004 (18.05.77) B05d-05 B32b-03 B32b-07/02<br>Support member for aq. material - has hydrophilic and hydrophobic parts, used in specimen testing appts.   | A89 J04 P42 P73<br>SEAR 22.03.73<br>*G8 1474-017 | A(12-B1, 12-L4) J(4-B).<br>ene glycol (II). Claimed compsns. for the coating include; 1 pt. (I); 2 pts. ethyl cellulose; 3 pts (II); 8 pts. methyl, ethyl or butyl methacrylate; 1 pt. (II); 9 pts cellulose nitrate.<br><br><b>EXAMPLE</b><br>A coating soln. was prepd. from 1/4% (I) in industrial methylated spirits (I. M. S.) and 2% ethyl cellulose in I. M. S. in proportions of about 80/20. The soln. was applied to an elongated tape of polyethylene terephthalate and the I. M. S. allowed to evaporate. A coating was left behind comprising 1 pt. (I); 2 pts. ethyl cellulose. (4pp904). |
| <p>A support member for carrying aq. material has an upper surface comprising a hydrophilic area surrounded by hydrophobic areas. The aq. material is inhibited from flowing between the two types of area.</p> <p>The member is pref. in the form of an elongated tape having a hydrophobic upper surface. A coating of a hydrophilic cpd. is then applied to the upper surface, either as a central longitudinal strip or as a series of areas spaced apart lengthwise.</p> <p><b>USE/ADVANTAGES</b><br/>For specimen testing appts. having plastic support tapes. The rectangular pools of aq. liq. have well defined areas and retain their shapes when the tapes pass through the appts.</p> <p><b>DETAIL</b><br/>The coating comprises <math>\geq 2</math> cpds., one of which is water soluble and hydrophobic, the other being water insol. The former cpd. is pref. polyvinyl pyrrolidone (I) or polyethyl-</p> |  |   |

- 25 ... of the tape to provide thereon res-  
pective discrete areas of the aqueous ma-  
terial, and means at an examination station,  
spaced from the applicator means in the said  
given direction, at which results of contact  
between the samples and reagent at the said  
upper surface may be monitored succes-  
sively, aqueous material is placed in a suc-  
cession of pools spaced apart along the  
upper surface of an elongated tape made of  
plastics material and the tape is moved lon-  
gitudinally through the apparatus. It is im-  
portant that the pools should occupy a  
generally rectangular area of the surface of  
the tape and that their width and length  
should lie within quite narrow limits. How-  
ever, we have found it impossible to control  
the width and the length of the pools placed  
on the support surface with sufficient reli-  
ability if the support surface is hydrophobic.  
Furthermore, it is important that the pools  
of aqueous material should retain their ori-  
ginal shape on the tape; but as the tape  
is moved through the apparatus the pools
- the said area.
- The coating may be of a material which  
comprises a mixture of at least two sub-  
stances, one of which is water soluble and  
hydrophilic in nature and the other of which  
is substantially insoluble in water. The water  
soluble substance may be polyvinyl pyrrol-  
idone or polyethylene glycol. Alternatively,  
the water insoluble substance is ethyl cel-  
lulose, methyl methacrylate, ethyl methacry-  
late, or butyl methacrylate.
- In one embodiment, the coating com-  
prises one part of polyvinyl pyrrolidone to  
two parts of ethyl cellulose.
- In another embodiment, the coating com-  
prises three parts of polyvinyl pyrrolidone  
to eight parts of methyl methacrylate.
- In a third embodiment, the coating com-  
prises three parts of polyvinyl pyrrolidone  
to eight parts of ethyl methacrylate.
- In a fourth embodiment, the coating com-  
prises three parts of polyvinyl pyrrolidone  
to eight parts of butyl methacrylate.
- In a fifth embodiment, the coating com-

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(71) We, G. D. SEARLE & CO. LTD., a British company, of P.O. Box 53, Lane End Road, High Wycombe, Bucks HP12 4HL, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a support member for carrying aqueous material.

Many plastics materials are hydrophobic in character, that is to say they are not easily wettable by aqueous material. In specimen testing apparatus known to us and comprising means defining a path of longitudinal movement for an elongated tape made of plastics material, drive means for advancing the tape longitudinally in a given direction along the said path, applicator means for applying respective samples of the aqueous material in succession to an upper surface of the tape to provide thereon respective discrete areas of the aqueous material, and means at an examination station, spaced from the applicator means in the said given direction, at which results of contact between the samples and reagent at the said upper surface may be monitored successively, aqueous material is placed in a succession of pools spaced apart along the upper surface of an elongated tape made of plastics material and the tape is moved longitudinally through the apparatus. It is important that the pools should occupy a generally rectangular area of the surface of the tape and that their width and length should lie within quite narrow limits. However, we have found it impossible to control the width and the length of the pools placed on the support surface with sufficient reliability if the support surface is hydrophobic. Furthermore, it is important that the pools of aqueous material should retain their original shape on the tape; but as the tape is moved through the apparatus the pools

of aqueous material are agitated by jets of air directed downwardly onto the upper surface of the tape, and even if it were possible to control satisfactorily the width and length of the pools initially placed on the tape, if the upper surface of the tape is hydrophobic the agitation by the air jets might cause a pool either to break up into a plurality of globules distributed along the tape, or to degenerate into single globules.

According to a first aspect of the present invention there is provided a support member in the form of an elongated tape for carrying aqueous material on an upper support surface of the tape, the upper support surface being hydrophobic and being provided with a coating which is confined to a central longitudinal portion of the tape, the coating being hydrophilic such that aqueous material applied to cover an area of the said coating is inhibited from subsequently flowing over or retracting from the boundary of the said area.

The coating may be of a material which comprises a mixture of at least two substances, one of which is water soluble and hydrophilic in nature and the other of which is substantially insoluble in water. The water soluble substance may be polyvinyl pyrrolidone or polyethylene glycol. Alternatively, the water insoluble substance is ethyl cellulose, methyl methacrylate, ethyl methacrylate, or butyl methacrylate.

In one embodiment, the coating comprises one part of polyvinyl pyrrolidone to two parts of ethyl cellulose.

In another embodiment, the coating comprises three parts of polyvinyl pyrrolidone to eight parts of methyl methacrylate.

In a third embodiment, the coating comprises three parts of polyvinyl pyrrolidone to eight parts of ethyl methacrylate.

In a fourth embodiment, the coating comprises three parts of polyvinyl pyrrolidone to eight parts of butyl methacrylate.

In a fifth embodiment, the coating com-

prises one part of polyethylene glycol to nine parts of cellulose nitrate.

According to a second aspect of the present invention there is provided a support member for carrying aqueous material on an upper support surface of the member, the said upper support surface having an area, defined by a physical boundary, which is hydrophilic and which is surrounded by hydrophobic portions of the said upper support surface so that aqueous material applied to the upper support surface within the said boundary to cover the said area is inhibited from flowing over or retracting from the said boundary.

According to a third aspect of the present invention there is provided a support member for carrying aqueous material on an upper support surface of the member, the said member being made of hydrophobic material and having an area of its upper support surface, defined by a physical boundary which is coated with hydrophilic material and which is surrounded by exposed portions of the upper support surface so that aqueous material applied to the coating to cover the said area is inhibited from flowing over or retracting from the said physical boundary.

It is preferred in the second and third aspects of the invention that the support member be in the form of a tape, as in the first aspect, and that a number of such areas be provided spaced apart from one another lengthwise of the tape.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to five Examples, and to the accompanying drawing in which:—

Figure 1 shows a length section of a first elongated tape, and

Figure 2 shows a length section of a second elongated tape.

In the two Figures like reference numerals denote like components.

Figure 1 shows a part of an elongated tape 4 made of polyethylene terephthalate (a hydrophobic material having thereon a surface coating 40 of hydrophobic material, i.e. it has a strong affinity to water. The coating 40 extends along the tape but only extends across a central portion of the tape, leaving hydrophobic material exposed on either side of the coating 40. The surface properties of the coating 40 are selected independence upon the particular aqueous material to be applied to the central portion of the tape so that when the selected aqueous material is so applied so as to form a substantially rectangular pool 100 on the coating, the coating 40 accepts the pool and also inhibits the pool from subsequently shortening or lengthening, even

when the aqueous material is agitated, for example by air jets. If the pool should be displaced in a direction across the tape, the exposed hydrophobic material prevents the aqueous material from spreading beyond the edges of the coating 40. The coating 40 is provided on the tape 4 by applying a solution to the tape and allowing the solvent to evaporate, leaving a coating of solute on the tape. Solutions which have been found to leave suitable coatings, that is coatings such that if an aqueous material is applied to the coating to form a substantially rectangular pool thereon, the coating accepts the pool and also inhibits the pool from subsequently shortening or lengthening, even when the aqueous material is agitated by air jets, are given in the following Examples 1 to 5.

#### Example 1

The preferred solution comprises a mixture of  $\frac{1}{4}$ % polyvinyl pyrrolidone in industrial methylated spirits (I.M.S.) and 2% ethyl cellulose in I.M.S. in proportions of approximately 80/20. The exact proportions are adjusted in dependence upon the required wettability of the coating. The solution is applied to the tape, the I.M.S. is allowed to evaporate, leaving a coating of one part of polyvinyl pyrrolidone to two parts of ethyl cellulose on the tape.

#### Example 2

A second suitable solution comprises a mixture of  $\frac{1}{4}$ % polyvinyl pyrrolidone in I.M.S. and 2% methyl methacrylate in acetone in proportions of approximately 75/25. The solution is applied to the tape and the I.M.S. and acetone are allowed to evaporate, leaving a coating containing three parts of polyvinyl pyrrolidone to eight parts of methyl methacrylate on the tape.

#### Example 3

A third solution is the same as that of Example 2 except that ethyl methacrylate is used instead of methyl methacrylate. The coating therefore contains three parts of polyvinyl pyrrolidone to eight parts of ethyl methacrylate.

#### Example 4

A fourth solution is the same as that of Example 2 except that butyl methacrylate is used instead of methyl methacrylate. The coating therefore contains three parts of polyvinyl pyrrolidone to eight parts of butyl methacrylate.

#### Example 5

A fifth solution comprises one part of polyethylene glycol (of molecular weight 1000) to nine parts of cellulose nitrate, dissolved in alcohol ether, comprising 25% diethyl

ether and 75% I.M.S. by volume (preferably the solution comprises one part of solute to ninety-nine parts of solvent). The solution is applied to the tape and the alcohol ether is allowed to evaporate, leaving a coating containing one part of polyethylene glycol (of molecular weight 1000) to nine parts of cellulose nitrate on the tape.

Figure 2 shows the tape 4 having thereon the surface coating 40 of hydrophilic material. The coating 40 covers rectangular areas of the tape, spaced apart along the tape and each surrounded by exposed hydrophobic material. If aqueous material is applied to the rectangular areas in sufficient quantity to flow across the coating 40 to the boundary thereof, the aqueous material forms rectangular pools, and the exposed hydrophobic material inhibits the aqueous material from flowing over the boundary. The rectangular pools retain the configuration of the coated areas of the tape even when they are agitated by air jets, owing to the degree of affinity to water of the hydrophilic material of the surface coating 40 and to the exposed hydrophobic material surrounding each area of surface coating 40. The coating 40 is provided on the tape 4 by applying a solution to the tape, to provide several rectangular areas of solution on the tape spaced apart therealong by exposed tape, and allowing the solvent to evaporate, leaving corresponding areas of the tape with a coating of solute.

#### WHAT WE CLAIM IS:—

1. A support member in the form of an elongated tape for carrying aqueous material on an upper support surface of the tape, the upper support surface being hydrophobic and being provided with a coating which is confined to a central longitudinal portion of the tape, the coating being hydrophilic such that aqueous material applied to cover an area of the said coating is inhibited from subsequently flowing over or retracting from the boundary of the said area.

2. A support member as claimed in claim 1, wherein the coating is of a material which comprises a mixture of at least two substances, one of which is water soluble and hydrophilic in nature and the other of which is substantially insoluble in water.

3. A support member as claimed in claim 2, wherein the water soluble substance is polyvinyl pyrrolidone or polyethylene glycol.

4. A support member as claimed in claim 2, wherein the water insoluble substance is ethyl cellulose, methyl methacrylate, ethyl methacrylate, or butyl methacrylate.

5. A support member as claimed in claim 2, wherein the material of the said coating comprises one part of polyvinyl pyr-

rolidone to two parts of ethyl cellulose.

6. A support member as claimed in claim 2, wherein the coating comprises three parts of polyvinyl pyrrolidone to eight parts of methyl methacrylate.

7. A support member as claimed in claim 2, wherein the coating comprises three parts of polyvinyl pyrrolidone to eight parts of ethyl methacrylate.

8. A support member as claimed in claim 2, wherein the coating comprises three parts of polyvinyl pyrrolidone to eight parts of butyl methacrylate.

9. A support member as claimed in claim 2, wherein the coating comprises one part of polyethylene glycol to nine parts of cellulose nitrate.

10. A support member for carrying aqueous material on an upper support surface of the member, the said upper support surface having an area, defined by a physical boundary, which is hydrophilic and which is surrounded by hydrophobic portions of the said upper support surface so that aqueous material applied to the upper support surface within the said boundary to cover the said area is inhibited from flowing over or retracting from the said boundary.

11. A support member for carrying aqueous material on an upper support surface of the member, the said member being made of hydrophobic material and having an area of its upper support surface, defined by a physical boundary, which is coated with hydrophilic material and which is surrounded by exposed portions of the upper support surface so that aqueous material applied to the coating to cover the said area is inhibited from flowing over or retracting from the said physical boundary.

12. A support member as claimed in claim 10 or 11, wherein the support member is in the form of an elongated tape and a number of such areas are provided spaced apart from one another lengthwise of the tape.

13. A support member in the form of an elongated tape for carrying aqueous material on an upper support surface of the member, substantially as hereinbefore described with reference to Example 1, 2, 3, 4 or 5 and Figure 1 of the accompanying drawing.

14. A support member for carrying aqueous material on an upper support surface of the member, substantially as hereinbefore described with reference to Figure 2 of the accompanying drawing.

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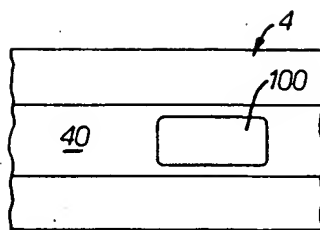


FIG. 1.

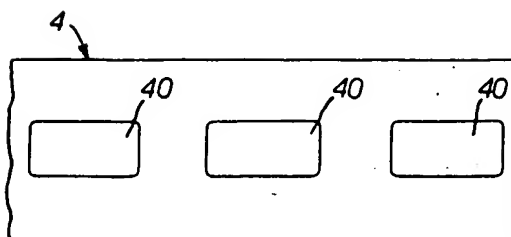


FIG. 2.

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